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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/039,309	11/07/2001	Eiji Sato	45672/56,682	2127
21874	7590	02/13/2004	EXAMINER	
EDWARDS & ANGELL, LLP			MONDT, JOHANNES P	
P.O. BOX 55874			ART UNIT	
BOSTON, MA 02205			PAPER NUMBER	
			2826	

DATE MAILED: 02/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/039,309

Applicant(s)

SATO ET AL.

Examiner

Johannes P Mondt

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 December 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Amendment*

Amendment filed 12/17/2003 forms the basis of this Official Action. In said Amendment Applicant substantially amended claims 4 and 8. Comments on Remarks in said Amendment are included below under "Response to Arguments".

### *Claim Objections*

1. **Claims 8-9** are objected to because of the following informalities: the wording "concave / convex" should be replaced by "concave or convex". Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:  
  
The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
2. **Claim 4** is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim contains subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. In particular, the newly added limitation that the liquid crystal layer has a value of the thickness  $d$  that changes "increasingly in a stepped fashion" (line 2) is not disclosed, whereby it is furthermore pointed out that any disclosure of a stepped change

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of a thickness must be made with regard to a referenced spatial scale in order to avoid indefiniteness (see below under 35 USC 112, second paragraph).

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. **Claim 4** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the verbiage “in a stepped fashion” (line 3) renders claim 4 indefinite, the notion of steps or stepped increases being essentially an issue of scale. Applicant’s disclosure does not define the boundaries of gradient values beyond which the thickness is to be considered changing in a stepped fashion.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. **Claims 1-2, 4-6 and 8-9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al (6,377,321) in view of Okada et al (JP406102485A). Khan et al teach a liquid crystal layer 22 (cf. col. 10, l. 42-47); a pair of substrates, e.g., 12 and 14 (cf. col. 10, l. 34-53), so as to interpose the liquid crystal layer there between,

and a plurality of pixels arranged in matrix pattern (inherently so when the electrode configuration is in matrix pattern) (cf. col. 11, l. 5-19), wherein: the liquid crystal layer “has a helical structure” in the sense as disclosed by Applicant, i.e., has molecules with helical symmetry in it (cf. col. 9, l. 53 – col. 11, l. 3) (N.B.: inherently, cholesteric molecules have helical axes) and exhibits at least two stable states including a planar state and a focal conic state according to an applied voltage (cf. col. 15, l. 36-51).

*Khan et al* do not necessarily teach a thickness  $d$  in each of the plurality of pixels to have to different values and the liquid crystal layer to include at least two regions having different values of a first threshold voltage for transitioning from the planar to the focal conic state.

However, the provision of thickness gradients within the liquid crystal layer so as to achieve a first threshold voltage difference for two regions within said liquid crystal layer would have been obvious in view of *Okada et al*, who teach said thickness to have a gradient in the liquid crystal layer, and thus have at least two different values (in fact all values between  $d_1$  and  $d_2$ ), as a means to achieve a gradient in the threshold voltage (cf. English abstract, “Constitution” and Figures 7 and 8(a)), and hence at least two different values in said threshold voltage.

*Motivation* to include the teaching by *Okada et al* into the invention by *Khan et al* stems from the desirability to avoid display instability, as explained by *Okada et al* (cf. English abstract, “Purpose”), while unstable displays are generically disadvantageous in the art of liquid crystal displays. *Combination* of said teaching with said invention is straightforward: the liquid crystal display by *Khan et al* also relies on helical molecules,

being of the chiral nematic liquid crystal variety (cf. abstract), while variation, in particular the inclusion of a thickness gradient is easily achieved over the spatial extent of a cell. *Success* in implementing the combination can therefore be reasonably expected.

*On claim 2:* although the condition  $d > P$  necessarily must be observed so as to exploit the helicity of the molecules for the simple reason that otherwise no helicity is present across the liquid crystal layer, and although Applicant has included an explanation for the inclusion of the further limitation  $d/P < 15$ , the number 15 in said limitation has not been explained in the disclosure. Therefore, Applicant's disclosure does not teach why the range as claimed is critical to the invention. In view of the absence of a teaching why a range is critical to the invention Applicant is reminded that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

*On claim 4:* setting aside the new matter limitation "increasingly" as discussed in the rejection under 35 USC 112, first paragraph, prompted by said new matter, any stepped change is an abstraction from a continuous change. Applicant does not delineate above which value of the gradient the change of thickness in the liquid crystal layer is considered discontinuous, and hence the claim must be considered indefinite, as expressed elsewhere. Moreover, a very large local gradient is defined by a range limitation. Applicant's disclosure does not teach why the range as claimed is critical to the invention. In view of the absence of a teaching why a range is critical to the

invention Applicant is reminded that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

*On claim 5:* while it is understood and while the examiner takes official notice that in the art of liquid crystal displays the thickness of the liquid crystal layer should be at least be considerable fraction of the pitch of the helical molecules in order that said liquid crystal layer can perform its function (said helicity is the essence of said liquid crystal layer), Applicant does not specifically disclose the criticality of the factor 0.5 in the range limitation that is the essence of claim 5. Therefore, Applicant's disclosure cannot be said to teach why the range as claimed is critical to the invention. In view of the absence of a teaching why a range is critical to the invention Applicant is reminded that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

*On claim 6:* in Okada et al the value of the thickness changes continuously across the pixels (cf. Figure 8a).

*On claim 8:* the upper surface of the lowest of the two substrates in Figure 7, hence the one closer to the liquid crystal layer than the other side of said substrate by Okada et al is concave as a whole.

*On claim 9:* the top surface of the bottom substrate in Figure 7 is concave, while the bottom surface of the top substrate in Figure 7 is both concave and convex



according to the second definition of convex cited from Merriam-Webster (see rejection under 35 U.S.C. 112 of claim 8 given above).

2. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al and Okada et al as applied to claim 1 above, and further in view of Masazumi (6,414,669). As detailed above, claim 1 is unpatentable over Khan et al and Okada et al. Neither Khan et al nor Okada et al necessarily teach the further limitation as defined by claim 3. However, it would have been obvious to define the thickness  $d$  in the manner as defined by claim 3 in view of Masazumi, who teaches in the analogous art of liquid crystal display devices with cholesteric phase (cf. col. 1, title and abstract) that the said first threshold voltage ("Vth2" in Masazumi, cf. col. 2, l. 1-23) for transitioning to the focal conic state is less than the second threshold voltage ("Vth1" and V1 in Masazumi, loc. cit.) (cf. Fig. 37).

*Motivation* to adhere to the teaching by Masazumi in this regard for the entire range of thicknesses is not to upset the driving method: if the condition that forms the basis of this claim were not met then for some portions of the pixel the homeotropic state would be achieved while other portions would remain in the focal conic state, which cannot be the intention of any liquid crystal device. Combination of the teaching by Masazumi in this regard in the invention by Khan et al and Okada et al is readily achieved by proper bracketing of the thicknesses in the liquid crystal layer. Success in implementing the combination can therefore be reasonably expected.



3. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al and Okada et al as applied to claim 1 above, and further in view of Scherer et al (5,880,801). As detailed above, claim 1 is unpatentable over Kahn et al and Okada et al, who do not necessarily teach the further limitation of claim 7.

*However, it would have been obvious* to include said further limitation in view of Scherer et al, who teach top and bottom substrates 42 and 44, respectively (cf. col. 4, l. 20-60) to be aligned horizontally and vertically, respectively, so as to achieve hybrid-aligned cells by which an electro-optic response is achieved at low voltage compared with a device with pure homogeneous alignment (cf. col. 3, l. 29-47).

*Motivation* to include the teaching by Scherer into the invention by Khan et al and Okada et al in this regard stems from the desirability to achieve response at low voltage (Scherer, loc.cit). Combination of said teaching and said invention is straightforward through the process to make HAN crystal cells as disclosed by Scherer et al (cf. col. 3, l. 7-47). Success in implementing said combination can therefore be reasonably expected.

### ***Response to Arguments***

1. Applicant's arguments filed 12/17/2003 have been fully considered but they are not persuasive. In particular,

(1) With regard to the traverse to the objection to the Specification and the related rejection of claim 8 under 35 USC 112, first paragraph:

Figure 9 shows a surface that, as a whole, is neither concave nor convex; however, one sub-surface that is concave and another that is convex can be discerned

within Figure 9, concavity or convexity depending on from which side the sub-surface is viewed. With this caveat the objection is herewith withdrawn under condition of compliance to the requirements for removal of an objection aimed at circumventing unnecessary misinterpretations (see Claim Objections).

(2) With regard to the traverse of the rejection under 35 USC 112, second paragraph, of claim 4:

Applicant has made a bona fide albeit unsuccessful effort to remove the grounds for said rejection, but has thereby introduced new matter: nowhere in the Specification liquid crystal layer thickness “changes increasingly in a stepper manner”: for the cited portion to be disclosed by Figure 1, an ordering must exist whereby  $d_{An+1} - d_{An}$  must be exceeded by either  $d_{An} - d_{An-1}$  or  $d_{An+2} - d_{An+1}$  for at least one choice of the natural number  $n$ . The Specification does not disclose such said ordering. None of the other Embodiments and none of the other Figures disclose said cited portion, where it is pointed out that Figure 9 does not disclose “in a stepped manner”.

(3) With regard to the traverse of the rejection under 35 USC 112, second paragraph, of claim 4: Applicant’s amendment has merely changed the ground for said rejection as “stepped” and “discontinuous” are synonymous.

(4) With regard to Applicant’s traverse of the rejections of claims 1, 2, 4-6, 8 and 9 under 35 USC 103(a) over Khan et al (6,377,321 B1) in view of Okada et al (JP406102485A), Applicant alleges that:

(a) In Khan et al, “there is no mention of a planar state or a focal conic state” (page 9 of Amendment). However, col. 15, l. 36-50 as previously

referenced states otherwise. A fortiori there is no teaching away in accordance with the lack of said mention.

(b) In Khan et al, "varying thicknesses in the different regions in a common LC layer simply are not contemplated by the Khan reference" (page 9 of Amendment). That is correct but irrelevant. Examiner has not stated otherwise, but instead has cited the Okada et al reference in this regard.

(c) "Okada" (i.e., Okada et al (JP406102485A)) "does not teach varying thickness gradients to achieve different threshold voltages in different regions of the LC layer" (page 10 of Amendment). This is correct, although it is irrelevant. Okada et al do, however, teach the following portion of claim 1: "a thickness  $d$  of the liquid crystal layer has at least two different values of the thickness of the liquid crystal layer, and the liquid crystal layer includes at least two regions having different values of a first threshold voltage": see Figure 7 and the text "It is preferable that the threshold gradients are provided by the cell thickness gradients" in the already cited portion "Constitution" of the English text as made available at the time of the previous Official Action. Furthermore, inclusion of the teaching in this regard by Okada et al inherently would produce said threshold voltage difference in the at least two regions to pertain to thresholds between the two stable states in Khan et al, which, as explained above, are indeed the planar and focal conic state.

Accordingly, said traverse cannot be accepted.

(5) With regard to the traverse of the rejection of claim 3 under 35 USC 103(a) over Khan et al, Okada et al (as above) and further in view of Masazumi (6,414,669), Applicant alleges that:

“Masazumi does not teach, mention or suggest any relationship between LC layers and voltages”. However, that is not needed to render the said claim 3 obvious, given Khan et al and Okada et al. As explained above, the relation between LC layers (LC layer thicknesses in particular) is in the cited portions of Okada et al, particularly their Figure 7 and the cited portion of the “Constitution” in the English abstract as cited in the previous Official Action, in which it has been explained that Masazumi teaches the ordering of threshold voltages as claimed.

(6) With regard to the traverse of the rejection of claim 7 under 35 USC 103(a), Applicant alleges that “Scherer does not makes up for the deficiencies in Khan et al and Okada references”. In other words, the traverse of the rejection of claim 7 entirely depends on the same arguments put forward for the traverse of the independent claim on which it depends, which traverse has been discussed above.

### ***Conclusion***

2. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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February 7, 2004

